

Modifiable Risk Factor of Coronary Heart Disease Incident on Patients with Diabetes Mellitus Type 2

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ABSTRACT

The aim of this research is to determine the risk factors related to coronary heart disease incidence in type 2 diabetes mellitus patient at Dr. M. Djamil Padang Hospital. This was an analytic research with case control study design around October 2014 until May 2015. Samples consisted of 39 cases and 39 controls with matching age and sex. The data were analyzed by using univariate, bivariate by using McNemar test, multivariate by using regression logistic test and stratification. The result showed that hypertension $p=0.002$ (OR=5, 95%CI 1.09-22.82), obesity $p=0.0001$ (OR=6, 95%CI 2.08-17.29), duration of DM $p=0.01$ (OR=3.2, 95% CI 1.17-8.73) and smoking $p=0.002$ (OR=7, 95%CI 1.59-30.80) were associated with coronary heart disease incidence in type 2 DM patient. The most dominant risk factor that was associated with coronary heart disease incidence in type 2 DM patient at Dr. M. Djamil Hospital was obesity $p=0.0001$ (OR=10.2, 95% CI 3.08-33.81). Hypertension OR=11.25, duration of DM OR=18, smoking OR=16.2, sport activity OR=18.6 and income level OR=15.7 had interaction of the association between obesity and coronary heart disease incidence in type 2 DM patient. Hypertension, obesity, duration of DM and smoking were risk factors that associated to coronary heart disease incidence in type 2 DM patient. Then, the most dominant risk factor that associated to coronary heart disease incidence in type 2 DM patient at Dr. M. Djamil Padang was obesity. Hypertension, duration of DM, smoking, sport activity and income level had interaction of the association between obesity and coronary heart disease incidence in type 2 DM patient.

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1. INTRODUCTION

Diabetes mellitus (DM) is one of the major causes of health problems. DM is a chronic disease that characterized by increased levels of sugar in body because pancreas unable to produce insulin as needed. About 90% patient Diabetes Mellitus was dominated by Diabetes Mellitus type 2. DM type 2 caused by peripheral insulin resistance that increased basal insulin secretion and finally made pancreas exhausted. DM type 2 is common in adults and the elderly [1].

According to IDF Diabetes ATLAS (2013), there were 382 million people in the world living with diabetes mellitus. DM patients in the world are in the age range 40-59 years of which 80% in the country with middle income per capita. Indonesia was ranked seventh with 8.5 million people living with diabetes in 2013 and estimated increase in 2035 which 14.1 million people becoming diabetes. According to

RISKESDAS (2007) Indonesia prevalence of diabetes was 5.7%. The prevalence of diabetes by province shows West Sumatra has a quite high prevalence 4.1% [2]-[4].

The improperly managed DM type 2 can cause a chronic disease and causes eyes, feet, kidneys and vascular complications. Vascular complications consisted of macrovascular complications (coronary heart disease, stroke and peripheral vascular disease) and microvascular (retinopathy, nephropathy, and neuropathy). About 65% of patients with diabetes die from coronary heart disease. The Frammingham Study showed that patient with DM Tipe 2 increases the risk developed CHD, it 2 times greater in men and 3 times greater in women which improve mortality and morbidity of CHD in patient with DM Tipe 2 [1],[5],[6].

World Health Organization Global Status Report (2010) shows the proportion cause of death in non-communicable diseases at the age ≤ 70 years contained in cardiovascular disease that first ranked by 39% in the world. This is followed by non-communicable disease, diabetes, cancer, respiratory chronic and others [7]. Results SKRT (2001) shown many of the deaths in Indonesia's population are caused by heart disease and blood vessels in the amount of 26.3%. National RISKESDAS report (2007) shows that the prevalence of heart disease in Indonesia amounted to 7.2%. The prevalence of heart disease in the province of NAD 12.6% sequentially, 11.8% of Central Sulawesi and West Sumatra 11.3%. West Sumatra including three large provinces in the prevalence of CHD in Indonesia [2],[8].

West Sumatra RISKESDAS Report (2007) showed the highest prevalence of heart disease in the District/ Rhe South Coast by 25% and the lowest in the Padang city, by 2.5%. Prevalence in Padang City was low but has significant meaning to the increase in cardiac cases annually. According to the Health Department of Padang city in 2011, CHD was included on 10 diseases leading cause of death in Padang. This proofing by The Padang City Health Department Profile that there was increased the number of deaths caused by heart disease in 2011-2013. In 2011 there were cases of heart disease deaths by 82 cases with the proportion of 20.7%. In 2012 there was an increase of cases of heart disease mortality by 89 cases with the proportion of 19%. Furthermore, in 2013 an increase in heart disease deaths by 99 cases with the proportion of 16.9% [3],[9]-[11].

The percentage of mortality as well as morbidity from CHD can be increased in patients with diabetes mellitus type 2. This is because patients with diabetes type 2 have 2 times risk greater for CHD. Risk factor of CHD was consisted of a non factor modification and modification factor. Non modification factors include age, gender and heredity history of CHD. Factors modification consists of physiological factors (long suffering from diabetes, obesity hipertensidan), behavioral factors (smoking, alcohol consumption, physical activity and sleep patterns/stay up) and socio-economic factors (income and education level).

Several studies related to CHD risk factors in patients with diabetes type 2 among the study Fadma et al (2013) shows the gender factor, dyslipidemia, smoking, duration of diabetes, hypertension and obesity are the risk factors for CHD events. Saowapa Research (2006) showed that a non modification factors (age and history of descent), modification factors (hypertension, cholesterol, diabetes mellitus, obesity, menopause, smoking, physical activity, alcohol consumption, stress, depression) and factors contextual (level of education, level of income, distance, transportation, and poverty) is a cardiovascular risk factor including CHD [1],[12].

Initial studies through medical records at Dr. M. Djamil which is the main referral hospital in West Sumatra is known that, increased occurred cases of CHD in patients with diabetes mellitus type 2 in 2010-2013. In 2010, there were 13 cases of CHD from 183 patients with diabetes type 2 (7%). In 2011 there was an increase of 15 cases from 183 cases of CHD patients with DM type 2 (28%). In 2012, there were decreased by 13 cases of CHD cases from 198 patients with diabetes type 2 (6%). Furthermore, in 2013 there was an increase of cases is quite high at 74 758 cases of CHD patients with type 2 diabetes mellitus (9.76%) [13]. From the above description problems, researchers interested to research more about modifiable risk factor for coronary heart disease (CHD) in patient with diabetes type 2 in Dr. M. Djamil Padang Hospital in 2014.

2. RESEARCH METHOD

This research is a quantitative study with case control study design. This study used sample from the case group and the control group and then compare the distribution of modifiable risk factors for coronary heart disease incident in patient with diabetes mellitus type 2 in both groups. The study was conducted at Dr. M. Djamil Padang Hospital from October 2014 until May 2015.

The cases population in this study were all patients DM type 2 who are diagnosed with CHD by doctors and recorded in the medical records of Dr. M. Djamil Padang Hospital in 2014 who lived in Padang. And the control population are all patient DM Tipe 2 who were not diagnosed with CHD by doctors and recorded in the medical record of Dr. M. Djamil Padang Hospital in 2014.

Sample size in this study based on a case-control sample size formula pairs as samples obtained minimum amount of 35 people. Then, samples added with 10% drop out therefore total sample is 78 sample consisted of 39 cases and 39 controls. The case sample in this study were taken by using simple random sampling method. The control is obtained by using purposive sampling method and matched by age and gender.

3. RESULTS AND ANALYSIS

Table 1 is the univariate analysis result, it showed respondents who had hypertension in the case group amounts of 26 people (33.33%) much more if compared to the control group (23.08%). For obesity showed that respondents who experienced of obesity is more occurred in the case group amounts of 26 people (33.33%) compared to the control group amounts of 6 people (7.69%). For long suffering of diabetes found that respondents with DM at large form 10 years is more in the case group amounts of 21 people (26.92%) compared with the control group amounts of 10 people (12.82%). For smoking habits found that respondents who have much more smoking habits was in the case group amounts of 26 people (33.33%) compared with the control group amounts of 14 people (17.95%). For sports found that respondents who do not exercise was much more in control group amounts of 31 people (39.74%) compared to the cases amounts of 27 people (34.62%). For income level, it can be seen that respondents who have less income levels than the minimum wage more was much in the control group amounts of 23 people (29.49%) compared with the cases amounts of 20 people (25.64%).

Tabel 1. Distribution Frequency of Independent And Dependent Variables

No.	Variabel	Cases		Control		Total	
		f	%	f	%	f	%
1	Hipertension						
	Yes	26	33.33	18	23.08	44	56.41
	Not	13	16.67	21	26.92	34	43.59
	Total	39	50	39	50	78	100
2	IMT						
	Obesitas	26	33.33	6	7.69	32	41.02
	Not Obesitas	13	16.67	33	42.31	46	58.98
	Total	39	50	39	50	78	100
3	Long Suffering DM						
	≥ 10 years	21	26.92	10	12.82	31	39.74
	< 10 years	18	23.08	29	37.18	47	60.26
	Total	39	50	39	50	78	100
4	Smoke						
	Yes	26	33.33	14	17.95	40	51.28
	Not	13	16.67	25	32.05	38	48.72
	Total	39	50	39	50	78	100
5	Sport						
	Not	27	34.62	31	39.74	58	74.36
	Yes	12	15.38	8	10.26	20	25.64
	Total	39	50	39	50	78	100
6	Income Level						
	< UMR	20	25.64	23	29.49	43	55.13
	≥ UMR	19	24.36	16	20.51	35	44.87
	Total	39	50	39	50	78	100

Table 2 is the bivariate analysis result it is known that hypertension has a value of $p=0.02$ and obesity has a value of $p=0.0001$. Then, smoking has a value of $p=0.002$ and the long suffering from diabetes has a value of $p=0.01$. Furthermore based on table 3 a dominant risk factor affecting the incidence of CHD in Dr. M. Djamil Padang Hospital at 2014 were obesity with $p=0.0001$ and OR 10.2 (95% CI 3.08 to 33.81).

Tabel 2. Association between Independent and Dependent Variables

No.	Variabel	Kasus		Kontrol		Total		OR (95% CI)	p value
		f	%	f	%	f	%		
1	Hipertension								
	Yes	16	41.03	10	25.64	26	66.67	5 (1.09-22.82)	0.02
	Not	2	5.13	11	28.20	13	33.33		
	Total	18	46.16	21	53.84	39	100		
2	IMT								
	Obesitas	2	5.13	24	61.54	26	66.67	6	0.0001

	Not Obesitas	4	10.26	9	23.07	13	33.33	(2.08-17.29)	
	Total	6	15.39	33	84.61	39	100		
3	Long Suffering DM								
	≥ 10 years	5	12.82	16	41.03	21	53.85	3.2	
	< 10 years	5	12.82	13	33.33	18	46.15	(1.17-8.73)	0.01
	Total	10	25.64	29	74.36	39	100		
4	Smoke								
	Yes	12	30.77	14	35.90	26	66.67	7	
	No	2	5.13	11	28.20	13	33.33	(1.59-30.80)	0.002
	Total	14	35.90	25	64.10	39	100		
5	Sport								
	Not	21	53.85	6	15.38	27	69.23	0.6	
	Yes	10	25.64	2	5.13	12	30.77	(0.21-1.65)	0.33
	Total	31	79.49	8	20.51	39	100		
6	Income Level								
	< UMR	11	28.20	9	23.08	20	51.28	0.75	
	≥ UMR	12	30.77	7	17.95	19	48.72	(0.31-1.78)	0.51
	Total	33	58.97	16	41.03	39	100		

The dominant risk factor is obesity. Furthermore conducted stratified analyzes was used to see the interaction or effect modifier or an increased risk of obesity relationship with CHD incident on patients with diabetes type 2 based on the status of hypertension, long suffering from diabetes, smoking, exercise and income level.

Tabel 3. Multivariat Analysis (Dominant Variables)

Variabel	OR	95% CI	Coefficient	SE	<i>p value</i>
Long Suffering DM	3.6	1.12-11.97	1.2986	0.6044	0.03*
Hipertension	1.9	0.61-5.93	0.6460	0.5794	0.26
Smoke	2.4	0.80-7.61	0.9088	0.5718	0.11
Obesity	10.2	3.08-33.81	2.3233	0.6110	0.0001*

Based on Table 4 the result stratified analysis showed that respondent patients with diabetes type 2 who are obese based on the status of hypertension (OR=11.2), long suffering from diabetes ≥ 10 years (OR=18), smoking (OR=16.2), sports (OR=18.6) and low income (OR=15.7).

Tabel 4. Analisis Stratification Obesity Relationships with Coronary Heart Disease in Patients with Type 2 diabetes based on the Status of Independent Variables

Status (Variabel)	OR (95% CI)	<i>p value</i>
Hipertension	11.2(2.52-50.08)	0.001
Non Hipertension	9.6 (1.83-50.28)	0.012
Long Suffering DM ≥10 years	18(1.88-171.88)	0.01
Long Suffering DM <10 years	9.6(2.42-37.94)	0.001
Smoke	16.2(2.88-91.83)	0.001
Non Smoke	6.1(1.33-28.20)	0.03
Not Sport	18.6(4.44-78.35)	0.00002
Sport	3.3(0.51-21.58)	0.40
Income level ≥UMR	15.7(2.86-86.57)	0.001
Income level <UMR	8.4(1.89-38.56)	0.01

The statistical test results obtained by using the McNemar test and find a significant relationship between hypertension, obesity, diabetes mellitus and long smoking variables with CHD incident on patients with diabetes type 2 in the Dr. M. Djamil Padang Hospital in 2014.

Hypertension is a condition when blood pressure under the normal limit of 140/90 mmHg. The unwell controlled hypertension causing damage to the muscles in the heart. If it occurs in patients with diabetes type 2 are become 2-3 times risk for CHD [14],[15].

Obesity can be measured by BMI. Obesity has a greater risk of developing CHD since obesity leads to atherosclerosis, hypertension, hyperlipidemia, and other conditions. People who are obese need to do physical activities such as exercise to control hypertension, hyperlipidemia, diabetes and maintain blood lipid profiles [16]-[19].

Long-suffering of diabetes that risk for CHD in patients with diabetes type 2 was in ranges ≥ 10 years. The length of a person suffering from diabetes affected by controlling their sugar and irregular food. The length of a person suffering from diabetes have an increased risk of chronic complications, including coronary heart disease [20],[21].

Smooking is a habit by one or more cigarettes each day. Smooking habits cause clumping and calcification of blood vessel walls. Besides smooking increases cholesterol and free fatty acids which cause constriction of blood vessels in the heart [18],[22].

Sport is one of the physical activity. Ideally, sports activities should be done 3-5 times a week. Exercise is very beneficial for the control of cholesterol, HDL, triglycerides, expenditure energy and help the circulation of bloodfacilitate. This leads to be avoided the deposition of cholesterol in the blood vessels. This also reduce the risk of CHD, especially in patients with diabetes type 2 [23],[24].

Income level is one of the economic status measured. Income level can affect a person's health status. This is due to a range of access to health care and traffic purchasing power of a person for health [18],[24].

Multivariate analysis showed the most dominant factor for developing CHD in patients with diabetes mellitus type is obesity. It is caused by a person within obesity state may lead to increased levels of cholesterol, hypertension and diabetes. Furthermore, if patients with diabetes type 2 are obese and have a hypertension, long-suffering DM big at 10 years, smooking, not exercising and having a low income status will increase at greater risk for CHD than those who did not have one that status [14],[16],[18].

The increased risk ocorred CHD for patients with diabetes who are obese and have one of the 5 status variables. This is caused by the interaction between obesity and the 5 variables and causing chronic complications and improve greater risk for CHD. Between obesity and the five variables can affected the cholesterol, blood sugar, HDL, triglycerides, thrombus formation, atherosclerosis and so on blood flow state the blood vessels in the heart. It has a greater risk of CHD if there is an interaction of both. Therefore it is necessary for patients with diabetes type 2 who are obese in controlling blood pressure, blood sugar, stop smooking habits and exercise in order to reduce the risk for CHD.

4. CONCLUSION

Hypertension, obesity, duration of DM and smooking were risk factors associated to coronary heart disease incidence in type 2 DM patients. The most dominant risk factor was obesity. Hypertension, duration of DM, smooking, sporct activity and income level had interaction of the association between obesity and coronary heart disease incidence in those patient.

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